

THE LARVA OF *MACROTREMIS INACUTA* (ODONATA: LIBELLULIDAE)¹

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ABSTRACT: A detailed description and illustrations of the larva of *Macrothemis inacuta* are provided. Larva is similar to *M. celeno* but can be distinguished by stouter movable hook, and larger lateral spines and dorsal protuberances on abdominal segments 8-9. Larvae were found living in lentic environments, in muddy areas close to the shore, where emerging and floating vegetation was present.

The Neotropical genus *Macrothemis* comprises 37 species described to date (Garrison, in litt.) of which only nine occur in Mexico and Central America (Paulson, 1982; González-Soriano & Novelo-Gutiérrez, 1996). Despite the fact that it is a very speciose genus, its immature stages are poorly known; larvae of only three species have been described: *M. celeno* (Selys) (Klots, 1932), *M. musiva* Calvert (Santos, 1970), and *M. pseudimitans* Calvert (Limongi, 1989). Here, we describe and illustrate the larva of *M. inacuta* Calvert. Terminology of the labium follows Corbet (1953).

Macrothemis inacuta Calvert

(Figs. 1-9)

Description: Exuviae yellowish-brown, larvae brown; body short and robust; integument covered with small spiniform setae.

Head: Two times wider than long, narrowed posteriorly, occipital margin slightly concave, cephalic lobes poorly developed, not bulging (Fig. 1), covered with minute spiniform setae and long delicate setae; compound eyes rather small, slightly more dorsal than lateral. Antennae 7-segmented (Fig. 2), the third the longest, relative length of antennomeres: 0.5, 0.7, 1.0, 0.6, 0.7, 0.8, 0.8; scape mostly pale with a dark dorsobasal spot, pedicel pale with a dark ring on distal end; third antennomere reddish-brown, antennomeres 4-6 dark in basal half, pale in apical half; last antennomere mostly pale with apex dark. Labrum bare, setose on distal border; clypeus bare. Frons and vertex with abundant spiniform setae and long and delicate setae. Mandibles biramous (Fig. 3), external branch with four cusps in both mandibles and a small cusp at base of ventral cusp on right mandible, internal branch vestigial, represented only by three, low, blunt protuberances slightly more developed on right mandible. Maxillae: Galeolaciniae with seven acute teeth (Fig. 4), four large and three smaller; palp with numerous, long, stiff setae, ending in a robust spine. Labium: Prementum-postmentum articulation reaching posterior margin of mesocoxae; prementum subrhomboid with 7+3 and 7+2 setae (Fig. 5a), lateral margins with small spiniform setae, ligula prominent with distal margin very slightly serrate and with a row of stout setae on dorsal surface, but very close to distal margin, its tip .

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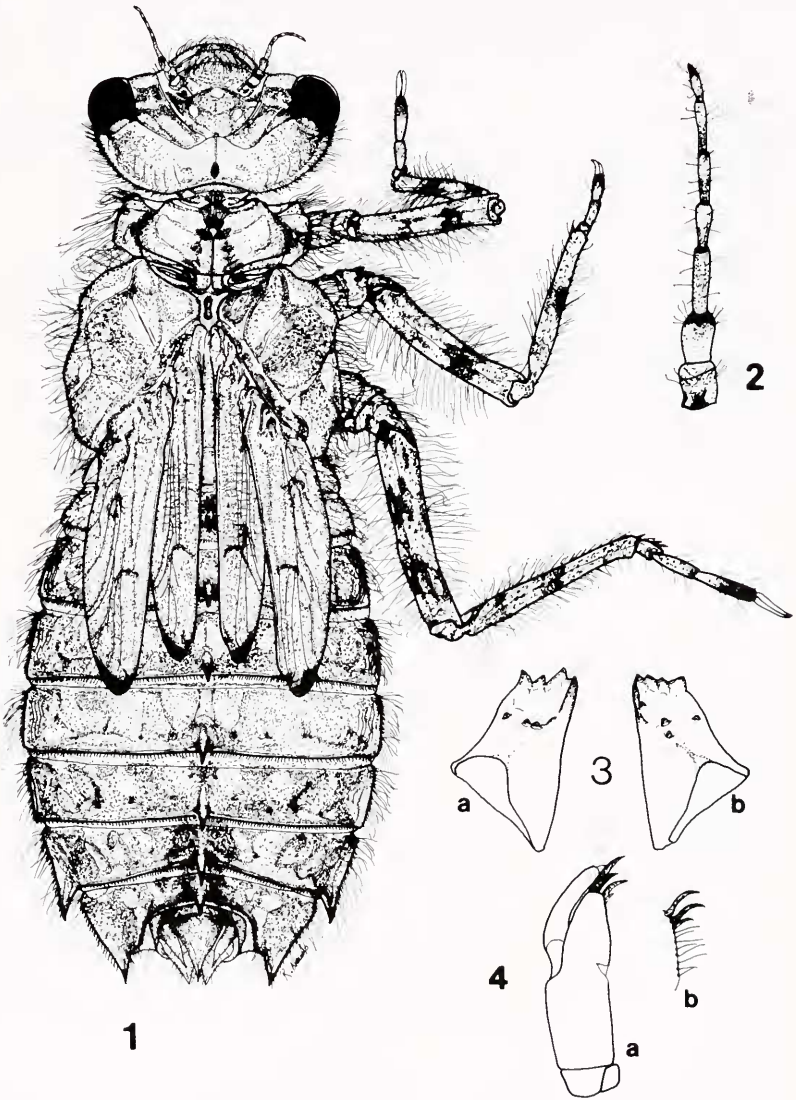


PLATE I. Figs. 1-4, *Macrothemis inacuta* larva. 1) Dorsal habitus of last instar larva (left legs omitted); 2) Left antenna, dorsal view; 3) Mandibles, ventrointernal view: a, left mandible, b, right mandible; 4) Ventral view of right maxilla (a), ventrointernal aspect of the dorsal teeth (b).

Labial palp with six long setae and a row of short, robust, spiniform setae on basal 0.70 of outer margin (Fig. 5c); movable hook robust, incurved, suddenly sharply-pointed, as long as palpal setae (Fig. 5a); distal margin of palp with seven crenations, notches between crenations deep, diminishing in depth from outer margin to internal one, each crenation finely serrate and bearing three stout setae, one large and two small, except the two dorsal crenations which bear only two (Fig. 5c); inner margin of palp with a single row of stout and stiff setae; a group of 7-9 setellae at base of palp close to articulation with prementum; surface of palp sprinkled with dark spots of different sizes in an irregular pattern.

Thorax light brown; lateral and posterior margins of pronotum rounded; pronotal disk yellow with an inverted, dark V-shaped spot on middle part (Fig. 1); anterior margin of proepisternum with a tuft of long stiff setae; proepimeron with a longitudinal reddish-brown stripe on its upper margin. Synthorax mostly dark, pale on sutures. Anterior and posterior wing pads dark, their tips darker brown, reaching and surpassing posterior margin of abdominal segment five respectively. Legs long (e.g. hind legs when fully extended reaching beyond the level of anal pyramid); meso- and metacoxae with a distal, ventrolateral, digitiform process (Fig. 6a); femora slightly compressed laterally, dorsal and external surfaces covered with long, stiff setae intermingled with spiniform ones; femora and tibiae pale, with a clear pattern of three transverse bands at basal, middle and distal portions; tarsi yellow, dark on apical 0.50 of third tarsomere; claws simple with a pulvilliform empodium.

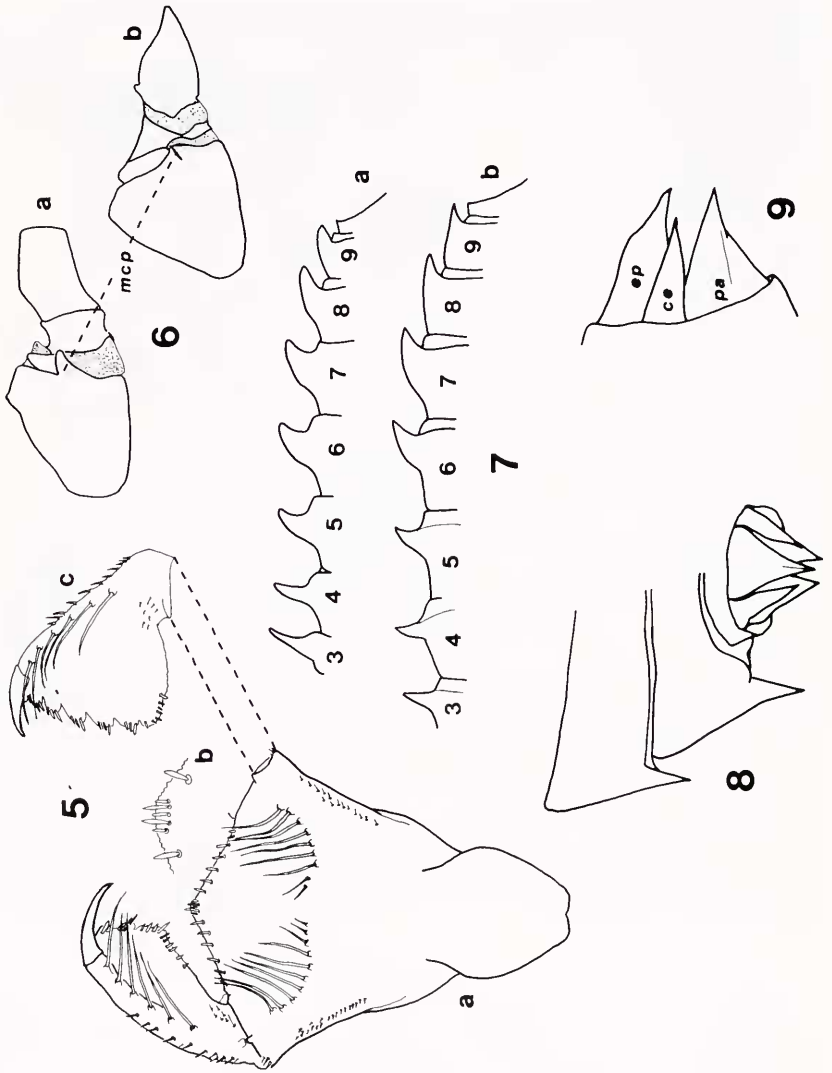
Abdomen reddish-brown, with a complex color pattern shown on Fig. 1; tergites 3-9 with spine-like protuberances well developed, that on 3 almost vertical, remainder gradually directed rearward (Fig. 7a); lateral margins of 2-3 slightly convex, straight on 4-7 and slightly concave on 8-9; those of 2-7 covered with minute spiniform setae which increase in length and robustness on 8-9; lateral spine on 8 0.65 as long as dorsal length of 8; that on 9 as long as or longer than dorsal length of 9, reaching level of tips of cerci (Fig. 8). Gonapophyses indistinguishable, just a minute gonopore visible in male. Epiproct and paraprocts pyramidal, acutely pointed, with small spiniform setae on margins; epiproct little longer than its basal width (ratio 1:0.8), in lateral view (Fig. 9), the basal 0.50 of its dorsal margin slightly concave then becoming straight but slightly slanting. Cerci sharply pointed, shorter than remaining appendages. Epiproct and basal 0.35 of cerci dark, distal 0.65 of cerci and all of paraprocts pale. Size proportions: Epiproct 1.0, paraprocts 1.0, cerci 0.80.

Dimensions (mm): Total length including appendages 17-17.6; abdomen 10.2-10.6; hind femur 4.2-4.4; maximum width of head 4.5-4.6; lateral spines on abdominal segment 8, 0.5; on 9, 0.6-0.7.

Material examined: 2 exuviae (♂♂), reared, 5 last instar larvae (4♂♂, 1♀). MEXICO: Veracruz; Emiliano Zapata, Miradores (Lagoon), 1000 meters above sea level (masl), 8-IX-1996. R. Arce leg., (5♂♂, 1♀) as last instar larvae. Deposited at Instituto de Ecología, A.C. Xalapa, México. COSTA RICA: Provincia de San José; Zona Protectora El Rodeo, 16-XI-1990, A. Ramírez leg., (1♂) as last instar larva. Deposited at Museo de Zoología, Universidad de Costa Rica.

DISCUSSION

The larva of *M. inacuta* closely resembles that of *M. celeno* in the number of palpal setae (6), size proportions on caudal appendages, and general stature. It differs by the larger and stouter movable hook on the labial palp, coxal processes more developed, larger lateral spines on abdominal segments 8-9, and larger dorsal protuberances on 3-9 (mainly those on 8-9). The larva of *M. inacuta* differs from that of *M. pseudimitans* by the stouter movable hook on the labial palp, the larger metacoxal digitiform process (cf. Fig. 6), and the shape of the dorsal protuberances on 7-9 (cf. Fig. 7). The larva of *M. musiva*



LATE II. Figs. 5-9. Morphology of *Macrothemis* larvae. 5) Dorsal view of prementum (a), detail of ligula (b), and dorsointernal view of right palp (c) of *M. inacuta*; 6) Left metacoxae of *M. inacuta* (a) and *M. pseudimitans* (b), showing metacoxal process (mcp), lateroventral view; 7) Profile view of abdominal dorsal line of *M. inacuta* (a) and *M. pseudimitans* (b); 8) Partial figure of abdominal segments 8-10 showing lateral spines on 8-9, dorsal view; 9) Left lateral aspect of

differs in having only 8 premental setae on each side of middle (5+3) and only 4 palpal setae. The genus *Macrothemis* has not been clearly defined based upon larvae; this is important in order to differentiate *Macrothemis* from the closely related genus, *Brechmorhoga*. Needham and Westfall (1955) tabulated some features based exclusively on *M. celeno*, but this does not constitute a generic characterization. At present, these genera can be differentiated by the following combination of features (those of *Brechmorhoga* [cf. Novelo-Gutiérrez, 1995] in parentheses): Integument mainly setose (granulose), cephalic lobes widely rounded, not bulging (bulging); pronotum with an inverted V-shaped dark mark (without such a mark); inferior margin of proepimeron with long and delicate setae (with short and robust setae); sides of abdomen convex throughout (parallel on segments 5-7); abdominal segment 10 and anal pyramid hidden laterally by the lateral spines of segment 9 (segment 10 and anal pyramid not hidden [partially hidden in *B. rapax*] by spines of 9); posterior margin of sternite 10 usually visible in dorsal view (not visible from above); dorsal protuberances well developed on abdominal segments 3-9, often acutely-pointed (well developed on 2-5 or 2-6, vestigial or lacking on posterior segments, often bluntly-tipped); cerci 0.75-0.80 as long as epiproct (cerci 0.50-0.66 as long as epiproct).

Ecological notes.- Larvae of *M. inacuta* were found in a lagoon in open pasture land, on the muddy bottom near shore where scattered aquatic vegetation grew. Mature larvae were caught on September 8, 1996. The lagoon was visited one year later (September 21, 1997) but no *M. inacuta* larvae were found, although teneral adults were captured in surrounding areas. These preliminary observations suggest potential synchrony (or seasonality?) in emergence of the larvae, probably starting at the end of August or beginning of September. Available published information indicates that all *Macrothemis* species dwell in lotic habitats (García-Díaz, 1938; Limongi, 1989; González-Soriano, 1992). However, Santos (1970) mentioned that *Macrothemis musiva* larvae probably inhabit intermediate lotic and lentic waters. *M. inacuta* is another exception since larvae were collected in lagoons, and adults are seen at streams and rivers. It is likely that when living in a lotic system the larvae favor still waters in pools and areas near the margins.

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